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PLANT MORPHOLOGY IN THE PACIFIC BASIN

By Sherwin Carlquist[1/]

Although the fields of plant morphology and anatomy include many botanists of quality and achievement, they have provided a curious and uneven history in the Pacific Basin, and many interesting plant groups remain neglected. Little anatomical work has been done in the Pacific Basin itself. Instead, the laboratories of France, America, England and Sweden have provided most of the studies which have, to date, appeared. Many interesting families and genera remain virtually unknown with respect to characteristics of internal structure and their evolution. One could say that plant morphology is in its infancy in the Pacific Basin, yet today morphologists lament that their field is a science lacking in official support, even approaching extinction owing to unwillingness of universities, colleges, and museums to provide positions in this field.

Reasons for this paradox do exist. The difficulty of collecting materials of families and genera scattered over vast distances and many islands is easy to understand, and these difficulties become compounded where liquid-preserved material, best for anatomical studies and mandatory for studies in embryology and ontogeny, is required. Wood anatomy depends upon collection of wood samples, which are bulky and difficult to dry in tropical climates. In terms of the collecting activities necessary, plant morphology is perhaps the most awkward of the biological sciences. The famous instance of Degeneria, the classical studies on whose morphology had to be based upon material fixed in gin, demonstrates some of the problems involved. Much can be done with dried specimens, and the ingenuity of plant anatomists willing to work with such material is laudable, although herbaria do, and should, abhor wasteful use of portions of dried specimens.

Another reason for the neglect of Pacifc groups by morphologists is the lack of academic institutions within the Pacific Basin. With few exceptions, museums and government laboratories rarely sponsor anatomical studies here or anywhere else in the world. Few studies in plant morphology have emanated from Japan, Australia, New Zealand, or Hawaii. Comparative morphology usually follows, rather than accompanies, plant exploration, so the lag in morphological studies in the Pacific, which is still relatively unexplored botanically, is understandable. Moreover, most morphologists tend to study plants within a limited radius of their institutions, and the remoteness of Pacific islands from the institutions where most morphologists reside explains the relative paucity of Pacific plants which have been viewed by microscope.

Mention of instances where morphologists have, despite the difficulties involved, sought to work on Pacific Basin species becomes a pleasure, so relatively few are good

1/ Rancho Santa Ana Botanic Garden, Claremont, California.

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studies. The lower vascular plants and gymnosperms have fared better than angiosperms, probably because the inherent morphological and evolutionary interest of Pacific genera makes their study mandatory. When one views the classic three volumes of F. O. Bower's "The Ferns", many studies involving Pacific ferns can be seen. Bower's own studies on ferns from this region are too numerous to mention. Many other morphologists gained their fame working on pteridophytes of this region. The paleobotanist-morphologist, W. H. Land, provided pioneer studies in Pacific Ophioglossaceae, and D. H. Campbell's book "The Eusporangiatae" involved Marattiaceae restricted to the region. J. E. Holloway is a name familiar to pteridophyte morphologists, and provides an exception to the tendency to study plants in a city remote from their native habitatas. Holloway's studies on Tmesipteris, Phylloglossum, and Hymenophyllaceae were based upon familiarity with these plants in New Zealand. Ferns and other pterdophytes are often easy to cultivate, a fact which has permitted morphologists to study these plants from fresh material grown in England or other places. Many British botanists, in fact, figure prominently in pteridophyte morphology, and those interested in Pacific ferns will find details of their sporangial development or stelar form in the pages of Annals of Botany, The New Phytologist, and other British journals, chiefly from 1880 to 1930.

Gymnosperms are not so easy to cultivate as pteridophytes, and search of botanic gardens for an Acmopyle, a Dacrydium, or an Athrotaxis will almost invariably be in vain. Material of gymnosperms for studies on embryology and other features is best collected in the field anyway. Obstacles of distance and the nuisances attendant on preserving fluids have willingly been overcome by gymnosperm students such as J. T. Buchholz, whose name is still known to non-botanists in New Caledonia for his thoroughgoing efforts to secure pickled material of southern hemisphere conifers and podocarps. From collections such as these, gymnosperm morphology and anatomy enjoyed a vogue in the three decades after the turn of the century. Such journals as Annals of Botany and Botanical Gazette became, to a not inconsiderable extent, vehicles for publication of study of gymnosperm morphology in those years. The workers involved in this international investigation of podocarps and conifers are too numerous to mention, but an idea can be gained from the bibliography in Chamberlain's "Gymnosperms -- Structure and Evolution" of the tremendous excitement with which Pacific gymnosperms were studied. Unravelling the evolutionary history of the gymnosperms required emphasis on Pacific genera, for many relicts survive only in this region. Although the intense activity has waned, Pacific gymnosperms are not completely known anatomically.

The Pacific Basin figures in a spotty or irregular fashion in studies on the morphology and anatomy of flowering plants. The centers of morphological study in Germany and England paid relatively little attention to Pacific angiosperms during the period when this science was most active, the three decades preceding and the three decades following the turn of the century. Paris showed more interest in anatomy of Pacific flowering plants, thanks largely to a single individual, Philippe van Tieghem. Van Tieghem's fantastically large output of studies, ranging boldly from fungi to flowering plants, was remarkably high in quality. Inevitably, materials from the Pacific were swept into his view, especially those which came from the French colonial possessions. To van Tieghem we owe the recognition of certain families. His names may not have nomenclatural priority because of the French orthography he used, but he was the first to demonstrate the distinctness of such Pacific families as Trochodendraceae, Tetracentraceae, and Strasburgeriaceae. In fairness, he recognized a number of additional families which have since vanished from the systematic scene; the new anatomical information he uncovered often apparently overimpressed him. In emphasizing the curious importance of the gymnosperm-like wood of certain Ranales, he foreshadowed the studies of I. W. Bailey. Although Bailey has never visited the islands of the Pacific, he and his students have, through their papers in the Journal of the Arnold Arboretum, made a major contribution to knowledge of Pacific angiosperms. This, however, is worthy of fuller discussion by Dr. A. C. Smith in another Newsletter. Aside from the remarkable work of I. W. Bailey and his students in exploring the morphology of primitive Pacific flowering plants and in intimating their significance in the problem of the origin of angiosperms, we find no other large grouping of plants which has been so intensively surveyed in this area.

In the field of wood anatomy, scattering contributions have been made, but one series of volumes, "Mikrographie des Holzes der auf Java vorkommenden Baumarten" by H. H. Janssonius, published between 1906 and 1936, stands out as a monumental regional contribution. More recently, the wood anatomists, H. D. Ingle and H. E. Dadswell, working under the auspices of the C.S.I.R.O. in Australia, have provided accounts of the wood of various South Pacific families and its taxonomic significance.

A worker who deserves special mention is Carl Skottsberg. Although primarily a taxonomist, Skottsberg realized the value of "endomorphic" characteristics. Those unfamiliar with this aspect of Skottsberg's work may be surprised to see, for example, sections of stems and leaves as illustrations in his paper on the Hawaiian Violas. Such anatomical studies, although incomplete, added much depth and soundness to Skottsberg's many contributions to Pacific botany. I am happy to acknowledge that Skottsberg, who feared he might never complete such studies, gave me valuable preserved material and encouraged me to study anatomically certain families, such as the Goodeniaceae, Lobeliaceae, and Compositae of the Hawaiian Islands and Juan Fernandez.

Plant morphology has much to offer allied fields of botany, as Skottsberg's work illustrates so well. One can safely say that studies which attempt to elucidate the taxonomy, phylogeny, and even migrations of a genus or family of the Pacific Basin are incomplete without anatomical studies. The Pacific Basin is rich in "anomalous" genera, such as Bauera (Cunoniaceae?), Alseuosmia (Caprifoliaceae?) or Corokia (Cornaceae?), the placement of which cannot be resolved without the aid of anatomical studies. One can only hope that morphological studies of these and the many other untouched problems awaiting study in the Pacific will be encouraged before a number of these interesting endemics become extinct and forever isolated from really effective and definitive anatomical investigations.

ORGANIZATION NOTES

NEW MEMBERS:

Mr. Hassan Ali Adlan
Department of Horticulture
University of Hawaii

Dr. Walter J. Apt
Pineapple Research Institute
2500 Dole Street

Dr. Anthony Hepton
1841 Makuakane

Mr. Charles R. Long
1710 Makiki Street
Apt. 1006

Mr. Alex L. MacGregor
441 Launiu Street

Mr. N. Mohanakurmaran
Box 1236, East-West Center
University of Hawaii

Mr. George A. Miura
1007 Long Lane

Mr. Shimei Nakaoshi
Department of Horticulture
University of Hawaii

Albert R. Mann Library
Acquisitions Division
Ithaca, New York 14850

MEETING PROGRAMS: The following programs were presented at the March, April, May, and June meetings:

March 2: Mr. Ted Green, Honolulu Botanical Gardens; "Plant collecting in the Southwest Pacific".

April 8: Dr. Horace Clay, Dr. Hiroko Ikeda, and Mr. George Walters; "Japanese Gardens".

May 4 : Dr. S. K. Majumder, Dept. of Horticulture, Univ. of Hawaii; "Botanical studies with florescence techniques".

June 1 : Dr. Dieter Mueller-Dombois, Dept. of Botany, Univ. of Hawaii; "Ecological studies in Hawaii Volcanoes National Park".

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SUMMER FORAY: The Hawaiian Botanical Society Summer Foray will be held on Saturday, July 18. All participants are asked to assemble at the parking lot of the H.S.P.A. Experiment Station on Keeaumoku Street at 9:00 A.M. The foray will be led by Mr. Thomas McGuire and Dr. George Gillett, and will be held on the Pupukea Trail at the north end of the Koolau Range. In case of adverse weather the foray will be held on Wiliwilinui Ridge at the south end of the Range. Plans for the day will be finalized at our 9:00 A.M. assembly point.

B O T A N I C A L N O T E S

VISITORS: Professor P. N. Mehra, Chairman of the Department of Botany at Punjab University, India, and specialist in the cytotaxonomy of Himalayan ferns and conifers, is visiting the University of Hawaii enroute to the International Botanical Congress at Edinburgh.

Professor Baki Kasapligil, Dept. of Biology, Mills College and specialist in Corylus visited the Dept. of Botany and the H. L. Lyon Arboretum enroute to Asia to continue his studies of this genus.

Dr. Richard White, Mr. William Anderson, and Mr. Marshall Crosby, all of Duke University, are conducting field studies in Hawaii during the summer months.

Dr. H. E. Moore, Director of the Bailey Hortorium and specialist on the Palmae, visited the Foster Botanical Garden and the Dept. of Botany and Lyon Arboretum at the University of Hawaii enroute to the mainland after extensive field studies in the Old World Tropics, Australia, and the South Pacific.

DEPARTMENT OF BOTANY: Drs. Maxwell Doty, Dieter Muller-Dombois, and A. C. Smith will attend the International Botanical Congress at Edinburgh in August. Dr. Muller-Dombois will attend the Vancouver meetings of the Pacific Coast Section, A.A.A.S. in June, and will be engaged in ecological research in Canada prior to attending the Congress. Dr. Charles Lamoureux will be in Japan until mid-July contributing to the Science Teachers Institute for teachers in schools of the U.S. Armed Forces. Dr. James Lockhart will be conducting research at the California Institute of Technology, Pasadena, during the summer months.

CONSERVATION CONFERENCE: The Third Annual State Conservation Conference was held in Honolulu on May 2. The highlight of the conference was the attendance of about 100 young conservationists from local high schools. This was a most successful meeting marked by spirited and meaningful discussions of pertinent topics, including the planned introduction of Axis Deer on Hawaii. The workshop on plants voted against this proposal with only one dissent. The Flora Committee of the Conservation Council is continuing its opposition to the proposal.

R E C E N T P A C I F I C P U B L I C A T I O N S

Gressitt, J. Linsley (Ed.). 1963. Pacific Basin biogeography. Symposium publication of the Tenth Pacific Science Congress. 561 pp. Bishop Museum Press. This book of authoritative papers seems destined to regular and frequent citations in future works on biogeography. Few biogeographers or systematic biologists will permit it to go far from their desks.

Neal, Marie C. 1963; 1964. Fruits and vegetables in Hawaii. The Garden Journal, N. Y. Botanical Garden. Vol. 13:212, Vol. 14:10. Miss Neal presents an interesting and well-illustrated account of food plants from the Algae to the Compositae.

Parham, J. W. 1964. Plants of the Fiji Islands. 353 pp. 104 illus. Government Press, Suva, Fiji. This is a most useful guide to the flora of Fiji and is based on a check list by B. E. V. Parham. It encompasses the vascular plants. Included are extensive bibliographies for cryptogams as well as phanerogams.

Romanowski, R. R. and Yukio Nakagawa. 1963. Chemical weed control in vegetable crops. Circular 402, Univ. of Hawaii Cooperative Ext. Serv. This is a useful guide to weed control chemicals and methods of application for the unique soil, climate, and weeds in Hawaii.

Skottsberg, Carl. 1964. Wikstroemiae Novae Hawaiiensis. Svensk Botanisk Tidskrift. Bd. 58, H. 1. Six additional species of Wikstroemia are described from the manuscript of the late Professor Skottsberg.

Warner, Robert M. 1964. A survey of citrus quality in Hawaii. Hawaii Farm Science Vol. 13:2. This presents some objective criteria and useful quality evaluations of citrus, with most interesting habitat correlations.

THE HAWAIIAN BOTANICAL SOCIETY

CONSTITUTION

ARTICLE I. Name

The name of this organization shall be "The Hawaiian Botanical Society".

ARTICLE II. Objects

The objects of this Society shall be:

a. To advance the science of Botany in all its applications.
b. To encourage research in Botany in all its phases.
c. To promote the botanical welfare of its members and to develop the spirit of good fellowship and cooperation among them in botanical matters.

ARTICLE III. Membership

Section 1. The Society shall consist of active members and Honorary Members.
Section 2. Any person who is interested in Plant Life of the Hawaiian Islands is eligible for membership in this Society.

ARTICLE IV. Officers

Section 1. The officers of the Society shall be a President, a Vice-President, a Secretary, a Treasurer, and two Directors, which together shall constitute the Executive Board.
Section 2. The officers shall be elected at the Annual Meeting each year. The term of office shall be one year, or until the next Annual Meeting. However, the officers shall continue in office until their successors are elected.
Section 3. Election of all officers and directors shall be by ballot. If there is but one nominee for an elective position, it shall be the duty of the Secretary to cast the elective ballot for the nominee.
Section 4. The President or Vice-President may not succeed himself in office except as hereinafter provided (By-Laws Art. IV -- duties of Vice-President).
Section 5. No member shall hold more than one office at a time.
Section 6. If a vacancy occurs in any office except that of President, a successor thereto shall be elected at the regular meeting following that at which the vacancy has been declared.
Section 7. The officers shall perform the duties prescribed for them in Robert's Rules of Order and as may be prescribed in the By-Laws or as ordered by the Society.

ARTICLE V. Annual Meeting

Section 1. The Society year shall run from December 1 to November 30.
Section 2. The December meeting shall be known as the Annual Meeting. If unusual circumstances prevent the holding of this meeting, a special or regular meeting shall be held as soon as possible thereafter, to be designated as the Annual Meeting.

ARTICLE VI. Amendment

This Constitution may be amended at any regular meeting of the Society by a two-thirds vote of all members present, provided that the amendment has been presented at the previous regular meeting.

THE HAWAIIAN BOTANICAL SOCIETY BY-LAWS

ARTICLE I. Membership

Section 1. Nomination to membership may be made by any member of the Society and presented to a member of the Membership Committee. Upon approval by one member of the Membership Committee, the nomination shall be presented to the Society at the next regular meeting. A majority vote of the Society shall elect the nominee to membership, subject to the payment of regular dues.

Section 2. The title of Honorary Member may be conferred on any person whose achievements in Botany and related sciences in the Islands may be considered as entitled to such special recognition. An Honorary Member shall be entitled to all the privileges of membership. Election to Honorary Membership shall be as hereinafter provided.

Section 3. Nomination to Honorary Membership shall be made in writing to any member of the Executive Board and must receive a two-thirds endorsement of the Executive Board before the person so nominated may be eligible for election. The Secretary shall report the name of the eligible nominee to the Society. Election of a candidate for Honorary Membership shall be at any regular meeting and shall require a two-thirds vote by ballot of the members present. Persons elected to Honorary Membership shall be so notified in writing by the Secretary of the Society.

Section 4. Any member, for a reason satisfactory to the Society, may be dropped from the membership roll by a two-thirds vote of the members present at any regular meeting.

ARTICLE II. Meetings

Section 1. Regular meetings shall be held the first Monday of each month where such Monday is not a legal holiday, except during the months of July, August, and September, and except as hereinafter provided.

Section 2. Field trips may be made in place of regular meetings at a time and place decided by the Society at a previous regular meeting.

Section 3. Special meetings may be called by the President, or by the Executive Board, or on the request of nine (9) active members.

Section 4. A botanical program shall be a feature of every regular meeting.

Section 5. Programs may be presented at regular meetings even though a quorum be not present.

Section 6. A quorum for the transaction of Society business shall consist of thirteen (13) members. A quorum of the Executive Board shall consist of three members, one of whom shall be either the President or the Vice-President.

ARTICLE III. Order of Business

The order of business shall be:

1. Introduction of guests.
2. Reading and approval of Minutes of the Previous Meeting.
3. Reports of officers, Executive Board, and Standing Committees.
4. Reports of Special Committees.
5. Unfinished business.
6. New business.
7. Scientific program.

ARTICLE IV. Duties of Officers

The President shall preside at the meetings of the Society, perform other duties provided for in these By-Laws, and carry out such other functions as usually pertain to the chief officer of such a Society. At the regular meeting in October, or two months before the Annual Meeting, he shall appoint an Auditor and a Nominating Committee.

The Vice-President shall perform the functions of the President in the absence or incapacity of the latter. In the event of the resignation or death of the President, the Vice-President shall become President for the unexpired portion of the term. He is

not thereby rendered ineligible for a full term as President (See Constitution, ARTICLE IV, Sec. 4).

The Secretary shall be the custodian of the records and papers of the Society, shall keep a record of the proceedings of the Society, shall furnish advance written notice of all meetings to the membership and shall present a written Annual Report of the year's activities at the Annual Meeting. He shall deposit all permanent records of the Society at the Library of the University of Hawaii.

The Treasurer shall receive the funds of the Society, keep a detailed account of the receipts and expenditures and render a written report of the Annual Meeting. He shall provide a list of members in good standing at the Annual Meeting.

ARTICLE V. Executive Board

The President, Vice-President, Secretary, Treasurer, and two Directors shall constitute the Executive Board. The Executive Board shall plan the programs of the meetings and execute the mandates of the Society.

ARTICLE VI. Committee

Section 1. Membership Committee. Directly after the Annual Meeting, the President shall appoint a Membership Committee composed of three members. Any member of the Membership Committee may present names of nominees to the Society for membership.

Section 2. The Nominating Committee shall present its report one month before the Annual Meeting.

Section 3. The Auditor shall audit the books of the Treasurer and shall report the findings to the Society at the first meeting subsequent to the Annual Meeting.

Section 4. Other committees may be appointed as directed by the Society or by the Executive Board.

ARTICLE VII. Dues

Section 1. The annual dues of active members shall be two dollars ($2.00) payable on the first regular meeting of the year. Only paid-up members shall be eligible to vote at the Annual Meeting.

Section 2. Honorary Members shall be exempt from payment of dues.

Section 3. Any member in arrears of dues after the following year's dues are payable shall be dropped from the rolls one month after being billed for the delinquent and current dues if both have not been paid within that period. Members dropped for dues delinquency shall be reported to the Secretary and to the Executive Board by the Treasurer.

Section 4. Special cases for reduction or remission of dues not included in the foregoing provisions may be decided by the Society at any regular meeting.

ARTICLE VIII. Parliamentary Authority

Robert's Rules of Order shall govern the proceedings of the Society, except in such cases as are covered in the Constitution, and By-Laws or as ordered by the Society.

ARTICLE IX. Amendment

These By-Laws may be amended at any regular meeting of the Society by a two-thirds vote of all members present, provided that the amendment has been submitted and read at the previous regular business meeting.

Committee on Constitution Review

D. P. Gowing

C. H. Lamoureux

May 1, 1963 E. J. Britten, Chairman

H A W A I I A N B O T A N I C A L S O C I E T Y
c/o Department of Botany, University of Hawaii, Honolulu, Hawaii 96822

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VICE-PRESIDENT----------Robert Warner
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(Dept. Botany, Univ. Hawaii)
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(Castle & Cooke, Inc., Box 2990, Hon.2)
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Mr. Oscar M. Kirsch
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Dr. Gerald G. Dull, Pineapple Research Institute, Box 3166, Honolulu
Robert E. Fraker, Plant Quarantine Div. ARS, USDA, Box 9067, Hon.

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THE HAWAIIAN BOTANICAL SOCIETY was founded in 1924 to "advance the science of Botany in all its applications, encourage research in Botany in all its phases," and "promote the welfare of its members and to develop the spirit of good fellowship and ccoperation among them." "Any person interested in the plant life of the Hawaiian Islands is eligible for membership in this Society."

The Hawaiian Botanical Society Newsletter is published in February, April, June, October, and December. It is distributed to all Society members and other interested individuals and institutions, with the purpose of informing them about botanical news and progress in Hawaii and the Pacific. News contributions and articles are welcomed. The deadline for submission of news items is the 20th of each month prior to publication.

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